

ON THE SPECIES OF *CRICULA*, A GENUS OF  
SATURNIIDAE.

By K. JORDAN, Ph.D.

MONSIEUR E. ANDRÉ, of Mâcon (France), informed me early this year that he had been successful in breeding from ovae laid by specimens obtained from imported pupae (from North India, presumably Assam), a species of *Cricula* which differed conspicuously, especially in the larva, from the Javan insect known to him as *Cricula trifenestrata*. As several names had been published for various forms of *Cricula*, Monsieur André sent me a ♂, a cocoon, and a very fine inflated full-grown larva of the insect he had bred, and asked me to ascertain which name, if any, applied to this species.

The insect is undoubtedly the one figured by Westwood as *Saturnia zuleika*. As this name cannot stand, for reasons given below, I have the pleasure of naming Monsieur André's species.

*Cricula andrei* nom. nov.

In the course of this summer, Mr. J. Henry Watson, of Withington, Manchester, who takes a great interest in Saturniids, also supplied me with the same species (imagines, live cocoons, full-grown live larvae and fertile eggs), as well as with young larvae, fertile eggs, live cocoons, and imagines of *Cricula trifenestrata*, the original cocoons of both species having come from Assam. This kind assistance on the part of Mr. Watson will enable us, we hope, to compare and describe all the stages of *C. andrei* and *trifenestrata* before the year closes.

Although an examination of the genitalia alone would have convinced us of the distinctness of *andrei* from *trifenestrata*, the evidence from breeding is especially welcome in a case like this, where the imagines are not always very easy to distinguish by their external appearance, and are mixed up in collections as mere colour-varieties of one species.

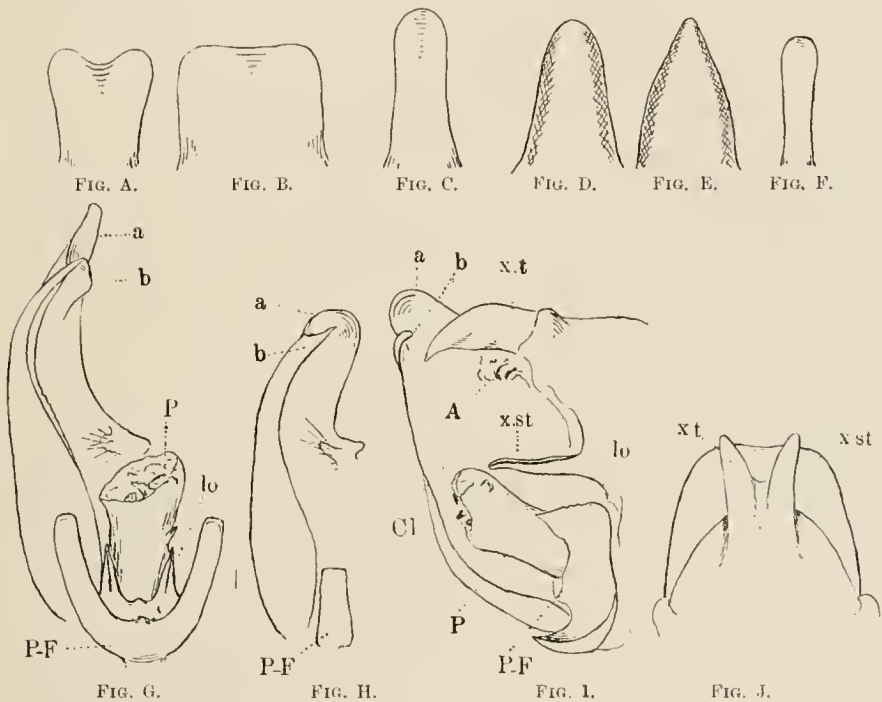
It is evident from the pattern and structure of the two species that the fact of the similarity being greater between the imagines than between the larvae is not due to secondary convergent development. On the contrary, the imagines appear to have preserved the facies of the common ancestor, whereas the larvae have become very different. As the various stages in the life of the individual have different functions, it is not surprising that in the phylogeny of the species these stages march at a different pace, and that the advance made in the larva may not be noticeable in the imago, or the inverse. In this respect the stages in the life-history of the individual may be likened to the various organs of a species, which as a rule vary independently of each other, one organ or part of it deviating very strongly from that of the nearest allied species, while another organ has remained stationary or has progressed but slowly.

Among *Saturniidae* it is of quite common occurrence that closely allied species differ much in the earlier stages. This fact should be borne in mind when dealing with classification, lest undue weight be laid on such differences.

1. *Cricula andrei* nom. nov.\*

*Saturnia zuleika* Westwood (nec Hope, 1843), *Cab. Or. Ent.* p. 25. t. 12. fig. 1. ♂ (1848) (Sylhet ; ♂ only, "♀" is ♂ of *trifenestrata*).

The specimen figured by Westwood is undoubtedly the insect bred by Monsieur André. The individual described as the female, however, is a male of *Cricula trifenestrata*; it is preserved in the collection of the Hope Department at Oxford, and has been examined by me. Westwood's "species" therefore was a mixture of two species, one of which had already a name. In such cases I treat the new name given to the mixture as a synonym of the older name. Moreover, the name *S. zuleika* was a very unfortunate choice, as Hope had already described and figured another silk-moth as *Saturnia zuleika*.



**Imago.**—*Male*: Forewing more strongly falcate than in *C. trifenestrata*, the apex being more produced and the outer margin more deeply incurved; the transparent spot larger; the postdiscal line in the upper half nearer to the margin, in the lower half farther away from it; the marginal area of a greyer shade than the disc, contrasting with it. Hindwing also with a larger transparent spot; the outer margin a little less rounded, and the anal angle somewhat more acute than in *C. trifenestrata*. On the underside the postdiscal white line is more prominent on both wings than in *C. trifenestrata*.—*Female*: The apex of the forewing more produced, the outer margin of both wings less rounded, and the

\* J. English has just published a description of the larva, in *Entom. Zeitschr.* xxii. p. 120 (Sept. 25, 1909, Stuttgart), under the name of *C. trifenestrata*.

white postdiscal line on the underside more prominent than in the ♀ of *C. trifenestrata*.

In North India both sexes are as a rule of a much brighter reddish tawny colour than *C. trifenestrata*.

**Genitalia.**—*Male*: The anal tergite (x. t.: cf. figs. 1 and 1, *C. trifenestrata* \*) is cleft at the apex, the two processes being pointed, a little curved downwards and hollowed out underneath. The anal sternite (x. st.) is a smooth brown ridge, which widens centrally into a broad truncate lobe. The clasper (fig. 6) is apically divided by a sinus into two lobes, one apical (*a*) and the other ventral subapical (*b*), both being rounded and, like the clasper, concave on the inside. The subapical lobe is placed transversely to the plane of the outer surface of the clasper, presenting its broad surface when viewed either from the apical or the basal side of the clasper. In *C. trifenestrata* (fig. 11) the corresponding lobe is always more or less in the same plane as surface of the clasper. The difference is easily perceived without dissection by removing or brushing aside the scaling at the tip of the clasper. The most remarkable difference, however, is found in the chitinous ridge which surrounds the base of the penis-sheath. This structure, which we termed "penis-funnel" in 1898,† consists in *Cricula andrei* of a ring, which is widened ventrally and here produced into two long cylindrical pale but hard processes, which are flattened at the tip (P-F, fig. 6). In *C. trifenestrata* there is always a **single** central process instead of the fork (P-F, fig. 11; and figs. A—F). The penis-funnel, moreover, bears on each side of the penis-sheath, and close to it, a pointed process in the shape of a three-sided pyramid (*lo*). The penis-sheath itself (P) has in the Indian race on the right side, at some distance from the apex, a black tubercle or tooth which is directed distad. This tubercle is also present in *C. trifenestrata* (fig. 1), but stands nearer the apex in that species, and is never enlarged to form a pointed tooth. Within the penis-sheath there is in the Indian race another armature, consisting of three pointed, and usually all three distinctly serrated, black processes (love-daggers ‡), which are pushed out with the duct during copulation, and doubtless serve as stimulating organs. Such organs are found in the majority of moths. In one of the females of *C. andrei* such a process was lying in the copulation cavity.—*Female*: The transverse chitinised ridge situated behind the genital orifice, and plainly visible as a rule without dissection, is centrally sinuate; this sinus is about as broad as it is deep in *C. andrei*, while it is always much narrower in *C. trifenestrata*.

**Cocoon.**—Spun up singly or in twos or threes, not in large clusters; pale yellow when quite fresh, fading into grey after some time; opaque, with a variable number of holes.

**Chrysalis.**—Less densely and less deeply punctured than in *C. trifenestrata*; the antennae and the upper lip somewhat broader. The last skin in the cocoon easily recognised as that of *C. andrei* by the numerous black spines.

\* Explanation of Figures A to J:

Figs. A to F = ventral process of penis-funnel.

x. t. = tenth tergite;

x. st. = tenth sternite;

A = anus;

Cl. = clasper;

P = penis-sheath;

P-F = penis-funnel;

*a* = apical lobe of clasper;

*b* = subapical lobe of clasper;

*lo* = lateral process of penis-funnel.

† *Nov. Zool.* v. p. 561 (1898).

‡ *Nov. Zool.* ix. *Suppl.* p. lxxxii. (1903).

**Larva.\***—First stages greenish yellow, tubercles of the same colour; last stage bright green with the tubercles red; the two dorsal tubercles of the eleventh segment united, in the first stages black, in the last stage reddish and placed on a green prominence; the bristles stouter than in *C. trifenestrata*, in first stages pale with dark tips, in last stage with black tips or quite black, central bristle of each tubercle more or less prolonged, on segments 1—4 and 10—11 ending in a long twisted filament. First stages with six rows of black spots; last stage without spots, but with a pale lateral line and numerous minute white granules, evenly distributed, each bearing whitish hairs; these hairs so thin that the body appears naked, apart from the setiferous tubercles. Head black or brownish green, immediately after ecdysis of the colour of the body.

Food-plants: oak, plum, blackthorn, etc.

We know the species from North India and Java, our specimens representing two geographical races:

*a. Cricula andrei andrei.*

♂ ♀. Very bright tawny, reddish tawny or ochraceous, as a rule much brighter than *C. trifenestrata*. The transparent spot of the hindwing of both sexes is larger than in *C. trifenestrata*. The female has at least one small transparent spot in the cell (at the proximal side of the large spots).

A series of both sexes in the Triang Museum from Sikkim, Bhutan, and Assam.

Type of name: ♂ from the Khasia Hills in Assam.

*b. Cricula andrei elaezia* subsp. nov.

♂. Olivaceous clay-colour, without any rufescent tints. Forewing darker olivaceous on disc; in front of the round transparent spot a row of three minute transparent dots.—Underside: the grey scaling and the grey lines more prominent than in *C. trifenestrata*.

Clasper as in *C. andrei andrei* (penis-funnel destroyed by an accident); penis-sheath much thinner than in *C. andrei andrei*, without armature on the out- and inside.

Only one specimen known: Dradjad, G. Kendang, Preanger, Java (ex coll. van de Poll).

In spite of the differences in the structure of the penis-sheath, I cannot but regard this Javan insect as a form of *C. andrei*. The genitalia vary to some extent also in the geographical races of *C. trifenestrata*.

## 2. *Cricula trifenestrata* Helf. (1837).

*Saturnia* (?) *trifenestrata* Helfer, *Journ. As. So. Beng.* vi. p. 45 (1837) (Assam; ♀ and cocoon).

This species is known to us from Ceylon, South and North India, Burma, the Malay Peninsula, the Andamans, Sumatra, Java, Lombok, Borneo, and Luzon, and may have a still wider range. The imago occurs, presumably in all places, in a

\* We abstain here from giving a detailed account of the various larval stages; the full descriptions will be published at a future date, when our observations are more complete.

paler or brighter form and a darker one, which are connected by intermediate shades of colour. The species, moreover, varies considerably geographically, not only in colour and external details, but also in the genitalia of the male. All races, however, are sharply separated from *C. andrei* in the genitalia of both sexes. The early stages, too, which we know from North India and Java, are very different from those of *C. andrei*.

**Imago.**—Both sexes vary from dark olive-brown without any tawny or yellow shade to bright ochraceous; the brightest specimens are more tawny than the palest individuals of *C. andrei*. The differences mentioned under *C. andrei* are generally sufficient for separating the two species. In doubtful cases the genitalia are a sure guide.

**Genitalia.**—*Male*: The tenth tergite (x. t., fig. 1) narrower in lateral view than in *C. andrei*. The apical lobe of the clasper (*a*, figs. H and 1) broader and the subapical lobe (*b*) much narrower, the latter almost in the same plane as the surface of the clasper, being but slightly twisted and appearing pointed in a ventral aspect (*b*, fig. H). The penis-funnel (P-F, fig. 1) is dorso-laterally produced into a flat triangular process (*lo*), and bears ventrally in the centre a single process of variable shape (figs. A—F) instead of the lyra-shaped fork of *C. andrei*. The penis-sheath (*v*) is similar to that of *C. andrei*, but the tubercle placed subdorsally on the right side is situated closer to the apex.—*Female*: The sinus in the centre of the postvaginal ridge is much narrower than it is deep.

**Cocoon.**—Smaller than in *C. andrei* and more yellow, generally spun up in large clusters. It varies much in texture, being an open network in some specimens, while in others it is opaque with a very variable number of pores.

**Chrysalis.**—Smaller than in *C. andrei*, more densely and deeply punctured in parts; antennae and upperlip narrower; cremaster as in *C. andrei*, obtuse, with thirty to forty strongly curved hooks, by means of which the chrysalis is fastened to the cocoon.

**Larva.**—Before first moult blackish above, pale yellow beneath, without sharply defined black spots; dorsal tubercles of eleventh segment nearer together than on the other rings, but remaining quite separate in all the stages. From the second stage onward the head and partly also the abdominal legs red, otherwise the second, third and early fourth stages nearly quite black; numerous whitish granules appear behind the tubercles, and a smaller number in front of the tubercles, each bearing a long hair; no granules and hairs on the intersegmental membranes. These granules and the tubercles later on are more or less surrounded with red, so that the full-grown larvae are black with red belts, the head, abdominal legs, a broad ventral stripe, and a lateral stripe being also red. All the tubercles with the central hair long, white, and twisted, the bristles of the substigmatal tubercles being all long and thin. As the bristles on the numerous granules are also long and much thicker than in *C. andrei*, the larva of *C. trifenestrata* looks almost woolly.

Food-plants: oak, cherry, plum, blackthorn, etc. In its native country *Machilus odoratissima* seems to be its favourite tree.

We know the larvae and cocoons from Java and North India. It appears to us doubtful if the larvae from the Andamans, Ceylon, Nilgiris, and Philippines, from which countries the caterpillar of *C. trifenestrata* is not yet known, will turn out to be identical with Javan and Indian examples. The imagines are readily distinguished by some slight differences.

*a. Cricula trifenestrata ceylonica* subsp. nov.

♂. Clayish ochraceous; transparent spot of forewing more heavily edged with black than usually. The process of the penis-funnel (fig. A) sinuate; subapical lobe of clasper broad.

♀. Tawny ochraceous. The three transparent spots of forewing heavily edged with black, especially on distal side; upper spot deeply incurved, its lower angle pointed; very little purplish grey shading on forewing. Antemedian line of hindwing heavy; transparent spot with conspicuous black border; marginal area purplish grey from anal angle nearly to third radial.—On underside the transparent spots of both wings more strongly edged with black than in the other races, the spot of hindwing transverse, anal area of both wings densely shaded with purplish grey like the disc, and this area more sharply defined than usually. Legs red.

*Hab.* Ceylon.

Several specimens in the Tring Museum and the British Museum.

*b. Cricula trifenestrata agria* subsp. nov.

A large form.

♂. Some specimens mummy-brown, others tawny ochraceous. In the dark (nymphotypical) form the black lines prominently edged with grey; the grey line of the underside heavy in both the dark and light forms; forewing beneath with the black dot in centre of cell absent, occasionally vestigial in dark form; on hindwing beneath the costal area more densely scaled with purplish grey than the disc.—The process of the penis-funnel very broad, truncate, flat, faintly depressed in centre of apex (fig. B); the two pointed processes of the anal tergite wider apart than usually; the subapical lobe of the clasper short and broad, sometimes very short.

♀. Only the dark form known to us. Very distinct from all the other geographical races. Body tawny ochraceous; wings so much shaded with fuscous and grey that the ochraceous ground-colour appears only along the costal edge of the forewing, at the costal margin of the hindwing in between the dark lines and sometimes at the abdominal margin of the hindwing; first and third transparent spots of forewing large, second relatively small.—Underside almost entirely shaded with grey, the grey postdiscal line very broad and diffuse on both wings.

*Hab.* Travancore.

A series of both sexes in the Tring Museum.

*c. Cricula trifenestrata trifenestrata* Helf. (1843).

*Saturnia* (?) *trifenestrata* Helfer, l.c. (Assam).

*Saturnia zuleika* Westw., *Cob. Or. Ent.* p. 25 (1848) ("♀" is ♂ of *trifenestrata*).

*Cricula burmana* Swinhoe, *Tr. Ent. Soc.* p. 191 (1890) (Burma).

Apparently everywhere a dark and a pale form; sometimes body and wings mummy-brown without tawny shades; other specimens, especially often the ♀♀ from Sikkim, bright tawny. The genitalia of the ♂ vary to some extent in our long series of specimens, a certain type being more often found in one country than in another. The ventral process of the penis-funnel narrow, flat, with the apex truncate, rounded, or pointed, or sometimes slightly widened (figs. c and n); the subapical lobe of the clasper always narrow and long.

*Hab.* Nilgiris, Sikkim, Assam, Burma, Malay Peninsula, Sumatra, Java, Borneo.

Common in collections.

The type of *burmana*, in the collection of the British Museum, belongs to this subspecies.

*d. Cricula trifenestrata lazonica* subsp. nov.

♂. Only one specimen known to us. In colour, shape, and pattern agreeing with ochraceous specimens of *C. t. trifenestrata*. Process of penis-funnel (fig. F) narrower than in the previous subspecies, slightly spatulate; subapical lobe very short on one clasper, absent from the other; penis-sheath slenderer than in the other races, without internal armature (lost in copulating?): anal tergite dorsally grooved.

*Hab.* North Luzon.

One ♂ in the Tring Museum.

*e. Cricula trifenestrata andamanica* subsp. nov.

A large subspecies, both sexes appearing in a dark and a pale form. The fuscous form is more or less strongly shaded with vinaceous.

♂. The costal margin of the forewing more strongly curved and the apex less produced than in true *trifenestrata*, the transparent spot small, the blackish postdiscal line straighter than usually. The two blackish lines of hindwing anteriorly united (which happens occasionally also in the other subspecies); discocellular spot without transparent centre or the pupil extremely small. Markings of underside less distinct than in *C. t. trifenestrata*.—Process of penis-funnel (figs. D, E, and I) always narrowed at the apex and its under-surface convex, not flat, the subapical lobe of clasper broader than in *C. t. trifenestrata* and as long as the apical lobe.

♀. Posterior half of outer margin of forewing more rounded than in *C. t. trifenestrata*; the three transparent spots large, in cell always a fourth spot of about one-third the size of the second spot of the row of three; postdiscal line a little more distal than usually, crossing the third radial midway between the outer margin and the third transparent spot instead of being nearer to this spot than to the margin. The two lines of hindwing approach each other anteriorly, but do not unite; the purplish grey shading at the outer margin forms a narrower band than in *C. trifenestrata*.

*Hab.* Andaman Islands.

A series of both sexes in the Tring Museum.

3. *Cricula drepanoides* Moore (1865).

*Cricula drepanoides* Moore, *Proc. Zool. Soc. Lond.* p. 817 (1865) (Sikkim).

Very different from *C. andrei* and *trifenestrata*. Only the ♂ known to us. Much more variegated than the other two species; forewing with a large irregular patch of numerous ochreous semitransparent spots; hindwing with one large and several small spots, which are ochreous edged with blackish brown and partly transparent. The genitalia are also different.

*Hab.* Sikkim and Bhutau.

A series of ♂♂ in the Tring Museum.